

WHAT IS CLAIMED IS:

1. A polarization conversion optical system for converting light having a nonuniform plane of polarization to light having a uniform plane of polarization, comprising:

- 5 a dielectric multilayer film having a different incidence angle dependency relative to a first polarized light component and a second polarized light component which have mutually intersecting planes of polarization, so as to transmit the first polarized light component and reflect the second polarized light component at a first incidence angle, and transmit the second polarized light component at a second incidence angle;
- 10 a reflecting element for reflecting light entering the dielectric multilayer film at said first incidence angle and transmitted through the dielectric multilayer film so as to impinge the dielectric multilayer film at said second incidence angle; and
- 15 a quarter-wavelength plate positioned medially to the dielectric multilayer film and the reflecting element.

2. The polarization conversion optical system claimed in Claim 1, wherein the reflecting element is a reflecting-type diffraction element.

3. The polarization conversion optical system claimed in Claim 1, wherein the transmittance of the first polarized light component at the first incidence angle of the dielectric multilayer film is 99% or higher, and the reflectivity of the second polarized light component at the first incidence angle is 99% or higher, and the transmittance of the second polarized light component at the second incidence angle is 95% or higher.
- 20

4. The polarization conversion optical system claimed in Claim 1, wherein the difference between the first incidence angle and the second incidence angle is 30° or less.

5. The polarization conversion optical system of claim 1, wherein said dielectric multilayer film comprises alternating layers of a first material containing SiO<sub>2</sub> and a second material containing TiO<sub>2</sub> and La<sub>2</sub>O<sub>3</sub>.

6. A polarization conversion element comprising:  
a dielectric multilayer film having a different incidence angle dependency relative to a first polarized light component and a second polarized light component which have mutually intersecting planes of polarization, so as to transmit the first polarized light component and reflect the second polarized light component at a first incidence angle, and transmit the second polarized light component at a second incidence angle;  
a reflecting-type diffraction element for reflecting light entering the dielectric multilayer film at the first incidence angle and transmitted through the dielectric multilayer film so as to impinge the dielectric multilayer film at the second incidence angle; and  
a quarter-wavelength plate positioned between the dielectric multilayer film and the diffraction element,  
wherein the dielectric multilayer film, quarter-wavelength plate, and diffraction element are integral with one another.

7. The polarization conversion element claimed in Claim 6, further including a substrate disposed between the dielectric multilayer film and the diffraction element.

8. The polarization conversion element claimed in Claim 6, wherein the diffraction element is formed on the surface of the quarter-wavelength plate, and the surface area of the quarter-wavelength plate functions as the diffraction element.

5 9. The polarization conversion optical system of claim 6, wherein said dielectric multilayer film comprises alternating layers of a first material containing  $\text{SiO}_2$  and a second material containing  $\text{TiO}_2$  and  $\text{La}_2\text{O}_3$ .

10003216 " 120601

10 10. A polarization conversion optical system, comprising:  
a dielectric multilayer film that reflects one polarization component of incident light at a first angle of incidence and transmits another polarization component of light at said first angle of incidence, and that transmits said one polarization component of light at a second angle of incidence;  
a quarter-wavelength plate that transmits light passing through said multilayer film; and  
15 a reflector disposed at a side of said quarter-wavelength plate opposite said multilayer film that receives light passing through said film and said quarter-wavelength plate at said first angle of incidence and reflects said received light back through said quarter-wavelength plate and said film at said second angle of incidence.

20 11. The polarization conversion optical system of claim 10, wherein said reflector comprises a diffraction grating.

12. The polarization conversion optical system of claim 11, wherein said diffraction grating is integrally formed on said opposite side of said quarter-wavelength plate.

13. The polarization conversion system of claim 11, wherein said diffraction grating is formed in an element that is distinct from said quarter-wavelength plate.

14. The polarization conversion system of claim 10, wherein said  
5 reflector is a planar mirror.

15. The polarization conversion optical system of claim 10, wherein said dielectric multilayer film comprises alternating layers of a first material containing  $\text{SiO}_2$  and a second material containing  $\text{TiO}_2$  and  $\text{La}_2\text{O}_3$ .

10003216 .120601